

WHAT IS CLAIMED IS:

1. A semiconductor component comprising:

a substrate;

5 a pad on the substrate;

an external contact bonded to the pad; and

a polymer support member on the substrate surrounding at least a portion of the external contact and configured to strengthen and prevent separation of the external contact

10 from the pad.

2. The component of claim 1 wherein the polymer support member comprises a polymer layer having a thickness approximately equal to one fourth to one half a height of the

15 external contact.

3. The component of claim 1 wherein the polymer support member comprises a polymer ring surrounding a base portion of the external contact and having a thickness approximately

20 equal to one fourth to one half a height of the external contact.

4. The component of claim 1 wherein the external contact comprises an element selected from the group consisting of contact balls, contact bumps, contact columns, contact balls on TAB tape, contact balls on a solder mask, and stud bumps on polymer tape.

5. The component of claim 1 wherein the component

30 comprises an element selected from the group consisting of semiconductor packages, semiconductor dice, and semiconductor wafers.

6. A semiconductor component comprising:

a substrate;
a pad on the substrate;
an external contact having a height and comprising a base portion bonded to the pad; and
5 a polymer ring surrounding the base portion having a thickness less than the height, the polymer ring configured to strengthen a bonded connection between the external contact and the pad.

10 7. The component of claim 6 wherein the thickness is approximately equal to one fourth to one half the height.

8. The component of claim 6 wherein the external contact comprises a solder ball.

15 9. The component of claim 6 wherein the polymer ring comprises a photoimageable polymer.

20 10. The component of claim 6 wherein the component comprises an element selected from the group consisting of semiconductor packages, semiconductor dice, and semiconductor wafers.

11. A semiconductor component comprising:

25 a substrate;
a pad on the substrate;
an external contact comprising a base portion bonded to the pad; and
30 a polymer layer on the substrate surrounding the base portion and having a thickness less than a height of the external contact, the polymer layer configured to absorb and forces applied to the external contact and to redistribute the forces away from an interface of the base portion with the pad.

12. The component of claim 11 wherein the external contact comprises a solder ball in a ball grid array or a fine ball grid array.

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13. The component of claim 11 wherein the external contact comprises a bump formed on the pad.

10 14. The component of claim 11 wherein the external contact comprises a solder column in a column grid array.

15 15. The component of claim 11 wherein the external contact comprises a ball in an opening of a solder mask attached to the substrate.

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16. The component of claim 11 wherein the external contact comprises a bump mounted to a polymer tape.

17. A semiconductor component comprising:

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a first substrate;

a first pad on the first substrate;

a contact ball on the first substrate comprising a base portion bonded to the pad and configured for bonding to a second pad on a second substrate;

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a solder fillet bonding the contact ball to the first pad; and

30 a polymer support member on the first substrate surrounding the base portion and configured to absorb and spread forces exerted on the solder fillet into a volume of the contact ball.

18. The component of claim 17 wherein the polymer support member has a thickness approximately equal to one fourth to one half a height of the contact ball.

19. The component of claim 17 wherein the polymer support member comprises a polymer layer on the substrate.

5 20. The component of claim 17 wherein the polymer support member comprise a polymer ring surrounding the base portion.

10 21. The component of claim 17 wherein the component comprises an element selected from the group consisting of semiconductor packages, semiconductor dice, and semiconductor wafers.

15 22. A semiconductor component comprising:
a substrate;

a plurality of external contacts on the substrate in a grid array, the external contacts comprising first portions bonded to the substrate with bonded connections, and second portions configured for bonding to a second substrate; and

20 a polymer layer deposited on the substrate to a thickness sufficient to substantially surround the first portions while leaving the second portions exposed, the polymer layer configured to absorb forces exerted on the bonded connections following bonding of the second portions
25 to the second substrate.

30 23. The component of claim 22 wherein the polymer layer has a thickness approximately equal to one fourth to one half a height of the external contacts.

24. The component of claim 22 wherein the polymer layer comprises a plurality of separate rings such that a separate ring surrounds each external contact.

25. The component of claim 22 wherein the external contacts comprise balls in a ball grid array.

26. The component of claim 22 wherein the external
5 contacts comprise columns in a column grid array.

27. The component of claim 22 wherein the bonded connections comprise solder fillets.

10 28. A semiconductor component comprising:

a substrate comprising a plurality of bonding pads in a grid array;

15 a plurality of contact balls on the substrate comprising first portions bonded to the bonding pads with bonded connections such that spaces are present between the contact balls and the bonding pads, and second portions configured for bonding to a second substrate; and

20 a plurality of polymer rings in the spaces substantially surrounding the first portions while leaving the second portions exposed, the polymer rings configured to absorb forces exerted on the bonded connections following bonding of the second portions to the second substrate.

25 29. The component of claim 28 wherein the polymer rings have a thickness substantially equal to one fourth to one half a height of the contact balls.

30 30. The component of claim 28 wherein the bonded connections comprise solder fillets.

31. An electronic assembly comprising:

a first substrate comprising a plurality of first contacts;

a component surface mounted to the first substrate comprising:

a second substrate comprising a plurality of bonding pads;

5 a plurality of external contacts on the substrate comprising first portions bonded to the bonding pads, and second portions bonded to the first contacts; and

10 10 a polymer layer on the substrate having a thickness sufficient to substantially surround the first portions while leaving the second portions exposed, the polymer layer configured to absorb and redistribute forces exerted on the external contacts to prevent separation from the bonding pads.

15 32. The assembly of claim 31 wherein the polymer layer has a thickness approximately equal to one fourth to one half a height of the external contacts.

20 33. The assembly of claim 31 wherein the polymer layer comprises a plurality of separate rings such that a separate ring surrounds each external contact.

34. The assembly of claim 31 wherein the external contacts comprise balls in a ball grid array.

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35. The assembly of claim 31 wherein the external contacts comprise columns in a column grid array.

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36. The assembly of claim 31 wherein the external contacts comprise balls on a solder mask.

37. The assembly of claim 31 wherein the external contacts comprise balls on a polymer tape.

38. The assembly of claim 31 wherein the external contacts comprise stud bumps on a polymer tape.

39. The assembly of claim 31 further comprising an
5 underfill layer between the component and the first substrate.

40. An electronic assembly comprising:

10 a first substrate comprising a plurality of first contacts;

a component surface mounted to the first substrate comprising:

a second substrate comprising a plurality of bonding pads in a grid array;

15 a plurality of contact balls on the second substrate comprising first portions bonded to the bonding pads with bonded connections such that spaces are present between the contact balls and the bonding pads, and second portions bonded to the first substrate; and

20 a plurality of polymer rings in the spaces substantially surrounding the first portions while leaving the second portions exposed, the polymer rings configured to absorb forces exerted on the bonded connections.

25 41. The assembly of claim 40 wherein the polymer rings comprise a photoimageable material.

42. The assembly of claim 40 an underfill layer between the component and the first substrate.

30 43. The assembly of claim 40 wherein the first substrate comprises a printed circuit board and the component comprises a chip scale package.

44. A method for fabricating a semiconductor component comprising:

5 providing a component substrate comprising a plurality of external contacts comprising base portions and tip portions; and

10 forming a polymer layer on the substrate substantially surrounding the base portions while leaving the tip portions exposed, the polymer layer configured to strengthen and prevent separation of the external contacts from the substrate.

15 45. The method of claim 44 wherein the forming step comprises depositing the polymer layer to a thickness approximately equal to one fourth to one half a height of the external contacts.

20 46. The method of claim 44 wherein the external contacts comprises solder balls in a ball grid array or a fine ball grid array.

47. The method of claim 44 wherein the external contacts comprise bumps formed on bonding pads.

25 48. The method of claim 44 wherein the external contacts comprises solder columns in a column grid array.

30 49. The method of claim 44 wherein the external contacts comprises balls on a solder mask attached to the substrate.

50. The method of claim 44 wherein the external contacts comprise bumps mounted to a polymer tape.

51. A method for fabricating a semiconductor component comprising:

providing a component substrate comprising a plurality of bonding pads and a plurality of contact balls on the 5 bonding pads comprising base portions and tip portions, the base portions and the bonding pad configured to form spaces therebetween, the tip portions configured for bonding to a second substrate;

depositing a photoimageable polymer material on the 10 substrate to substantially surround the base portions and fill the spaces;

exposing the polymer material using an exposure energy directed at the balls and at the polymer layer such that the polymer material within the spaces is protected by the balls 15 and remains unexposed; and

developing the polymer material to form polymer rings within the spaces substantially surrounding the base portions.

20 52. The method of claim 51 wherein the polymer material comprises a thick film resist.

53. The method of claim 51 wherein the contact balls are arranged in a ball grid array or a fine ball grid array.

25 54. The method of claim 51 wherein the component comprises an element selected from the group consisting of semiconductor packages, semiconductor dice, and semiconductor wafers.

30 55. A method for fabricating a semiconductor component comprising:

providing a component substrate comprising a plurality of bonding pads and a plurality of external contacts

comprising base portions bonded to the bonding pads and tip portions configured for bonding to a supporting substrate;

5 depositing a curable polymer material on the substrate substantially surrounding the base portions while leaving the tip portions exposed; and

curing the polymer material to form polymer layer configured to absorb and redistribute forces on the external following bonding of the tip portions to the supporting substrate.

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56. The method of claim 55 wherein the external contacts comprise an element selected from the group consisting of contact balls, contact bumps, contact columns, contact balls on TAB tape, contact balls on a solder mask, 15 and stud bumps on polymer tape.

57. The method of claim 55 wherein the component comprises an element selected from the group consisting of semiconductor packages, semiconductor dice, and semiconductor 20 wafers.

58. The method of claim 55 wherein the component comprises a chip scale package and the external contacts comprise contact balls in a ball grid array or a fine ball 25 grid array.